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by

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Abstract

Measurements of fall-out radioactivity in Greenland in 1971 are reported. Sr-90 (and Cs-137 in most instances) was determined in samples of precipitation, sea water, vegetation, animals, and drinking water. Estimates of the mean contents of Sr-90 and Cs-137 in the human diet in Greenland in 1971 are given.

CONTENTS

Statens trykningskontor
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ABBREVIATIONS AND UNITS

FP	fission products
pCi	picocurie, 10^{-12} Ci, $\mu\mu$Ci
nCi	nanocurie, 10^{-9} Ci, mμCi
mCi	millicurie, 10^{-3} Ci
S. U.	pCi Sr-90/g Ca
M. U.	pCi Cs-137/g K
nSr	natural (stable) Sr
S. D.	standard deviation, $\sqrt{\frac{\Sigma(x-x_i)^2}{(n-1)}}$
S. E.	standard error, $\sqrt{\frac{\Sigma(x-x_i)^2}{n(n-1)}}$
S. S. D.	sum of squares of deviation, $\Sigma(x-x_i)^2$
f	degrees of freedom
s^2	the variance
v^2	the ratio between the variance in question and the residual variance
P	the probability fractile of the distribution in question
η	coefficient of variation, relative S. D.
anova	analysis of variance

1. INTRODUCTION

1.1.

In 1971 the sampling programme from the previous years was used with only a few modifications.

1.2.

As hitherto, the samples were collected through the local district physicians and the heads of the telestations. However, it is not possible to obtain all samples scheduled in the programme.

1.3.

The estimated mean diet in Greenland was unchanged as compared with 1962, i.e., it was in accordance with the estimate given by Professor E. Hoff-Jørgensen, Ph.D., nutritional consultant to the Danish Atomic Energy Commission.

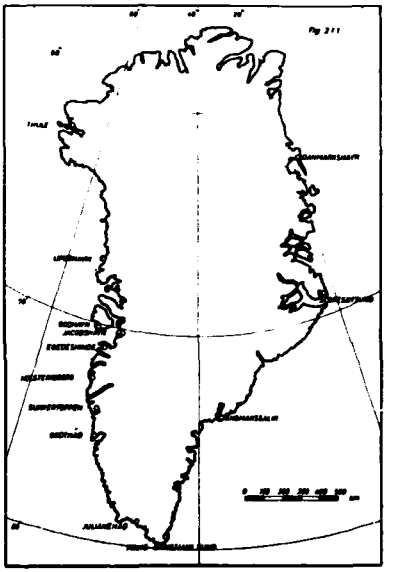

Fig. 1. Greenland

1.4.

The environmental studies in Greenland were carried out along with corresponding investigations in Denmark (cf. Risø Report No.265[2]) and in the Faroes (cf. Risø Report No.266[3]).

1.5.

The present report will not repeat information concerning sample collection and analysis already given in ref. 1.

2. RESULTS AND DISCUSSION

2.1. Sr-90 in Precipitation

Table 2.1.1 shows the results of the measurements.

The total fall-out levels in 1971 at Upernavik and Godthåb were respectively 0.6 and 0.9 times the 1970 figures. The specific activity at these stations was a little higher and a little lower respectively in 1971 as compared with 1970. In Denmark[2] the fall-out levels also decreased from 1970 to 1971 whereas they increased in the Faroes[3] (cf. also fig. 2.1.2).

Table 2.1.1

Sr-90 in precipitation collected in Greenland in 1971

Location	Unit	Jan.-Mar.	Apr.-June	July-Sept.	Oct.-Dec.	1971
Upernavik	pCi/l	2.73	3.34	4.78	0.84	$\bar{x}$ 2.32
Σ 95 mm	mCi/km^2	0.01	0.01	0.16	0.04	Σ 0.22
Godhavn	pCi/l	(1.46)**	3.53	2.94	0.63	$\bar{x}$ (1.89)**
Σ 381 mm*	mCi/km^2	(0.02)*	0.28	0.30	0.11	Σ (0.72)*
Godthåb	pCi/l	1.22	2.87	0.94	0.70	$\bar{x}$ 1.32
Σ 665 mm	mCi/km^2	0.09	0.37	0.38	0.04	Σ 0.88
Prins Chr.Sund	pCi/l	(1.09)**	(2.78)**	1.39	0.71	$\bar{x}$ (1.52)**
Σ 2189 mm*	mCi/km^2	(0.72)*	(1.60)*	0.67	0.33	Σ (3.32)*
Kap Tobin	pCi/l	0.72	4.05	1.69	0.70	$\bar{x}$ 1.39
Σ 295 mm	mCi/km^2	0.10	0.20	0.06	0.05	Σ 0.41

* Precipitation amounts from Meteorological Institute of Copenhagen

** Calculated from VAR 3 (cf. table 2.1.2)

Table 2.1.2

Analysis of variance of ln pCi Sr-90 / precipitation in Greenland 1971

Variation	SSD	f	s^2	F	F
Betw. locations	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Betw. quarters	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Remainder	[illegible]	[illegible]	[illegible]	[illegible]	

2.2. Sr-90 in Sea Water

Only one sample was obtained from the current sampling along the Greenland coasts, namely a sample from Danmarkshavn which contained 0.31 pCi Sr-90/l (salinity 21.6 o/oo). The level corresponds excellently to the mean level found at Danmarkshavn in the period 1967-70, which was 0.31 pCi Sr-90/l (1 S.E. = 0.02).

Fortunately we got two other sets of sea water samples from Greenland waters in 1971.

From the Dana we obtained the samples shown in table 2.2.1. These samples were collected in the North Atlantic from the Faroes to Greenland and along the S.W. coast of Greenland.

The Sr-90 activity (in pCi per m^3) from the North Atlantic stations may be related to the sampling depth (in metres) by the equation:

$$\text{pCi Sr-90/m}^3 = 115\ e^{-0.00072m} .$$

By integration of this equation we may estimate the accumulated fall-out down to a depth of 2500 m. We find 133 mCi Sr-90/km^2. This is approx. 33% more than we would expect from fall-out measurements at the Faroes[3] but in reasonable agreement with the estimated levels at Prins Christians Sund (cf. 4.1).

From 0-100 metres depth the integrated level becomes 11 mCi Sr-90/km^2. In 1964 when we collected samples from nearly the same locations (cf. Risø Report No. 109, p. 9-12[1]) we found in this layer 23 mCi Sr-90/km^2. Hence the Sr-90 levels have decreased by a factor of more than two in the uppermost 100 metres of the North Atlantic from 1964 to 1971. As the accumulated fall-out in soil was approx. 6% higher in 1971 than in 1964, the decrease in sea water must be due to vertical transport.

The other set of samples was obtained through the Royal Danish Hydrographic Office in co-operation with the Canadian Coast Guard Ship Louis S. St. Laurent and the Royal Danish Navy. Table 2.2.2 shows the results.

In agreement with earlier years' observations the Sr-90 activity in sea water was inversely proportional to the salinity. This was also the case for the samples in table 2.2.2 except the 3 last ones, which were collected in the Inglefield Fjord. These samples showed at the same time both low salinities and low Sr-90/levels. The samples probably contained melting water from icebergs, which consist of fresh water essentially free of Sr-90. The other samples in table 2.2.2 followed the equation:

$$pCi\ Sr\text{-}90/l = -0.045^{o}/oo + 1.56$$

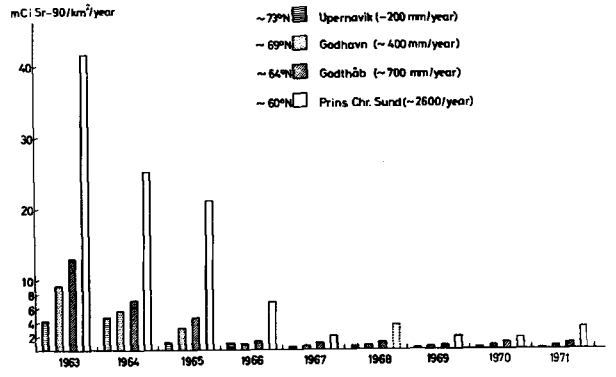

Fig. 2.1.1. Annual Sr-90 fallout at four Greenland locations in 1963-71

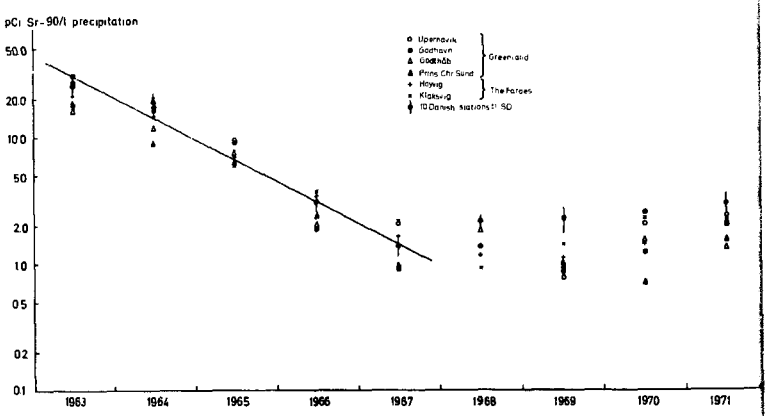

Fig. 2.1.2. Annual specific mean activity of Sr-90 in precipitation collected in Denmark, the Faroes and Greenland in 1963-71. The regression curve $y = 44.7\ e^{-0.76t}$ was calculated from the ten Danish stations in 1963-67

Table 2.2.1

Sr-90 in sea water collected at Greenland in July 1971 by the Dana

Location	Position W	Position N	Depth in m	pCi Sr-90/l	Salinity in o/oo
No. 1	60°59'	4°16'	0	0.170	34.2
No. 2	-	-	100	0.090	34.8
No. 3	-	-	1000	0.070	34.9
No. 4	62°00'	32°20'	0	0.101	34.6
No. 5	-	-	100	0.080	34.8
No. 6	-	-	1000	0.071	34.8
No. 7	-	-	2300	0.070	34.9
No. 8	58°19'	56°52'	0	0.181	30.4
No. 9	-	-	400	0.103	34.2
No.10	58°02'	55°28'	0	0.155	32.7
No.11	58°00'	56°07'	0	0.183	30.2
St. 15598	61°57'	50°00'	0	0.226	29.8
St. 15599	61°52'	50°35'	0	0.254	30.7
St. 15600	61°47'	51°09'	0	0.165	31.8
St. 15601	~ 62°	~ 50°		0.105	33.6
St. 15602	61°52'	50°35'	0	0.128	32.4
St. 15603	61°26'	53°25'	0	0.145	32.4
St. 15620	61°30'	53°37'	0	0.115	31.9
-	-	-	100	0.258	33.7
-	-	-	1000	0.068	34.8

Table 2.2.2

Surface sea water samples collected in the Nares Strait and Baffin Bay in August 1971 by the Canadian Coast Guard Ship Louis S. St. Laurent

Latitude N	Longitude W	Date	Depth m	Salinity in o/oo	pCi ^{90}Sr/l
78°30'4	73°42'0	18	450	30.6	0.19
79°39'3	71°17'0	19	216	28.6	0.26
80°45'2	67°02'0	19	405	29.4	0.30
82°05'0	61°29'5	20	612	28.8	0.26
82°32'4	62°02'0	22	90	29.5	0.23
81°30'5	63°51'5	27	603	30.0	0.23
76°43'0	73°02'0	25	36	31.2	0.19
77°26'6	69°17'0	29	411	29.4	0.18
77°46'0	70°42'0	30	62	lost	lost
77°30'0	66°46'0	31	70	29.5	0.12

Table 2.3.1

Sr-90 and Cs-137 in reindeer and musk ox collected in Greenland in 1971

Month	Location	Species	Sample type	pCi Sr-90/kg	pCi Sr-90/g Ca	nCi Cs-137/kg	pCi Cs-137/g K
Apr.	Danmarkshavn	Musk ox	Meat	38	295	0.11	33
		Musk ox	Bone	-	360	-	-
	Collected by the Royal Greenland Trade Company at the south-west coast	Wild reindeer leg I	Meat	16	127	2.51	409
		Wild reindeer leg I	Bone	-	129	-	-
		Wild reindeer leg II	Meat	25	455	2.57	668
		Wild reindeer leg II	Bone	-	130	-	-
		Wild reindeer shoulder	Meat	-	-	0.40	104
		Wild reindeer shoulder	Bone	-	119	-	-

Table 2.3.2

Sr-90 and Cs-137 in lamb collected by the Royal Greenland Trade Company at the south-west coast of Greenland in 19

	Sample type	pCi Sr-90/kg	pCi Sr-90/g Ca	pCi Cs-137/kg	pCi Cs-137/g K
Lamb I	Meat	12	116	579	257
Lamb I	Bone	-	73	-	-
Lamb II	Meat	6	75	802	274
Lamb II	Bone	-	77	-	-
Lamb III	Meat	12	82	511	247
Lamb III	Bone	-	111	-	-
Lamb IV	Meat	14	67	615	175
Lamb IV	Bone	-	94	-	-
Lamb V	Meat	15	215	610	214
Lamb V	Bone	-	-	-	-
Lamb VI	Meat	4	65	753	243
Lamb VI	Bone	-	129	-	-
Mean±1 SE	Meat	11±2	103±24	645±45	235±14
	Bone		97±10		

2.3. Sr-90 and Cs-137 in Terrestrial Animals

Samples of reindeer and lamb were obtained through the Royal Greenland Trade company from the west coast of Greenland. Tables 2.3.1 and 2.3.2 show the results.

The means of the reindeer and lamb samples were 15 pCi Sr-90/kg meat and 1.2 nCi Cs-137/kg, cf. fig. 2.3 which shows the geometric means of Sr-90 in bone and Cs-137 in meat of reindeer from Greenland collected in the period 1961-71 (cf. the comments given in Risø Report No. 132[1]).

A musk ox sample was obtained from Danmarkshavn, the Cs-137 level was similar to those found in animals from the previous years[1], but the Sr-90 levels were significantly higher.

2.4. Sr-90 and Cs-137 in Sea Animals

The mean levels in fish and shrimps (flesh) were 7 pCi Sr-90/kg and 17 pCi Cs-137/kg (cf. table 2.4.1).

Table 2.4.1

Sr-90 and Cs-137 in sea animals collected around Greenland in 1971

Month	Location	Species	Sample type	pCi Sr-90/kg	pCi Sr-90/g Ca	pCi Cs-137/kg	pCi Cs-137/g K
July	Diskobugt 69°15'N 53°08'W	Shrimps	Total	6.6	0.6	8.29	1.37
Aug.	Frederikshåb	Shrimps	Total	14.0	1.3	8.92	2.73
-	Egedesminde	Angmagsetter	Total	8.6	1.8	12.60	4.1
	Collected by the Royal Greenland Trade Company at the south-west coast	Salmon I	Meat	4.0	3.8	5.76	1.75
		Salmon I	Bone	-	3.4	-	-
		Salmon II	Meat	13.2	6.4	6.56	1.77
		Salmon II	Bone	-	2.9	-	-
		Salmon III	Meat	4.2	6.4	29.75	8.45
		Salmon III	Bone	-	3.6	-	-
		Cod I	Meat	3.6	41.9	31.72	7.78
		Cod I	Bone	-	-	-	-
		Cod II	Meat	4.0	47.2	30.61	7.58
		Cod II	Bone	-	-	-	-

2.5. Sr-90 and Cs-137 in Vegetation

Only two vegetation samples were received in 1971. Table 2.5 shows the results. The seaweed showed the same pCi Sr-90/g Ca and pCi Cs-137/g K ratios as found in the sample from Danmarkshavn in 1970.

Table 2.5

Sr-90 and Cs-137 in vegetation samples collected in 1971

Month	Location	Species	pCi Sr-90/g ash	pCi Sr-90/g Ca	pCi Cs-137/g ash	pCi Cs-137/g K
Autumn	Danmarkshavn	Seaweed	0.31	6.2	0.85	8.5
Autumn	Danmarkshavn	Moss	13.40	1020	27.65	2670

2.6. Sr-90 in Drinking Water

Quarterly samples of drinking water were as previously collected from a number of locations in Greenland. Table 2.6 shows the results from 1971 and fig. 2.6 the results from four of the locations for the period 1962-1971.

As in the previous years, we found it most expedient to choose the geometric mean of all figures, i.e. 0.50 pCi Sr-90/l, as representative of the mean level of Sr-90 in Greenland drinking water in 1971.

Table 2.6

Sr-90 in drinking water collected in Greenland in 1971

(pCi Sr-90/l)

Location	Jan.-Mar.	Apr.-June	July-Sept.	Oct.-Dec.
Danmarkshavn	0.23	3.23		1.57
Ittoqqortoormiit			1.00	0.11
Godthåb		0.30	0.27	0.27
Godthåb				0.72

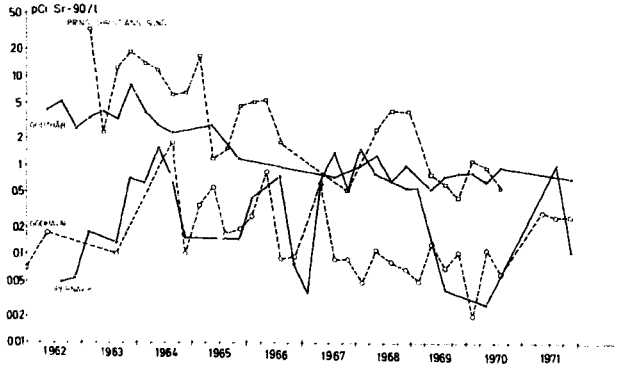

Fig. 2.6. Sr-90 in Greenland drinking water, 1962-71

3. ESTIMATE OF THE MEAN CONTENTS OF Sr-90 AND Cs-137 IN THE HUMAN DIET IN GREENLAND IN 1971

3.1. The Annual Quantities

The estimate of the daily per capita intake of the different foods in Greenland is still based on the figures given in 1962 by Professor E. Hoff-Jørgensen, Ph.D., in Risø Report No. 65[1].

3.2. Milk Products

All milk consumed in Greenland was imported as milk powder from Denmark. The mean radioactivity content in milk prepared from Danish dried milk produced in 1971 was 8.6 pCi Sr-90/kg and 14 pCi Cs-137/kg[2].

The cheese was also imported from Denmark and contained 61 pCi Sr-90/kg and 10 pCi Cs-137/kg.

3.3. Grain Products

All grain was imported from Denmark. It is assumed that only grain from the harvest of 1970 was consumed in Greenland during 1971. The daily per capita consumption was: rye flour (100% extraction): 80 g, wheat flour (75% extraction): 110 g, rye flour (70% extraction): 20 g, biscuits (rye, 100% extraction): 27 g, and grits: 25 g. The content of Sr-90 in these five products was 31, 8, 6, 23, and 22 pCi/kg respectively. Hence the mean content of Sr-90 in grain products was 18 pCi/kg. The content of Cs-137 in the five products was 85, 29, 42, 63, and 42 pCi/kg. Hence the mean content of Cs-137 in grain products was 52 pCi/kg.

The activity levels in rye flour (100% extraction), wheat flour (75% extraction) and grits were all taken from tables 5.9.1 and 5.9.2 in Risø Report No. 265[2]. The Sr-90 level in rye flour (70% extraction) was calculated by analogy with the level in wheat flour (75% extraction), i.e. as one-fifth of the whole-grain activity. The Cs-137 content in rye flour (70% extraction) was calculated as one half of the whole-grain level in rye, i.e. the ratio between Cs-137 in whole wheat grain and in wheat flour (75% extraction)[2]. The Sr-90 and Cs-137 contents in biscuits were calculated by dividing the levels of the rye flour (100% extraction) by 1.35, since 1 kg flour yields 1.35 kg bread[2].

3.4. Potatoes, Other Vegetables, and Fruit

The Danish mean levels for 1971 were used[2] as the local production is insignificant as compared with the imports from Denmark.

The Danish mean levels were: in potatoes 3.5 pCi Sr-90/kg and 10.8 pCi Cs-137/kg, in other vegetables 11 pCi Sr-90/kg and 1.6 pCi Cs-137/kg, and in fruit 4.7 pCi Sr-90/kg and 5.9 pCi Cs-137/kg.

3.5. Meat

Nearly all meat consumed in Greenland is assumed to be of local origin. Approx. 10% comes from sheep, 5% from reindeer, 60% from seals, 5% from whales, and 20% from sea birds and eggs.

The activity in reindeer and lamb was estimated from tables 2.3.1 and 2.3.2. Seals and whales were estimated from the 1970 results to have contained 1 pCi Sr-90/kg and 30 pCi Cs-137/kg, and sea birds and eggs were estimated to have contained the same as in 1969 i.e. 0.14 pCi Sr-90/kg and 90 pCi Cs-137/kg. Hence the mean levels in Greenland meat from 1971 were 2.8 pCi Sr-90/kg and 193 pCi Cs-137/kg.

3.6. Fish

All fish consumed was of local origin, and the mean levels from 2.4 were used, i.e. 7 pCi Sr-90/kg and 17 pCi Cs-137/kg.

3.7. Coffee and Tea

The Danish figures for 1971[2] were used for coffee and tea, i.e. 27 pCi Sr-90/kg and 168 pCi Cs-137/kg.

3.8. Drinking Water

The geometric mean calculated in 2.6 was used as the mean level of Sr-90 in drinking water, i.e. 0.50 pCi Sr-90/l. The Cs-137 content was as previously[1] estimated at 1/4 of the Sr-90 content, i.e. approx. 0.1 pCi Cs-137/l.

Tables 3.1 and 3.2 show the estimates of Sr-90 and Cs-137 respectively.

Table 3.1

Estimate of the mean content of Sr-90 in the human diet in Greenland in 1971

Type of food	Annual quantity in kg	pCi Sr-90 per kg	Total pCi Sr-90	Percentage of total Sr-90 in food
Milk and cream	78	8.6	671	15.6
Cheese	2.5	61	152	3.5
Grain products	95.6	18	[illegible]	40.1
Potatoes	32.8	3.5	115	2.7
Vegetables	5.5	11	60	1.4
Fruit	13.5	5.9	80	1.9
Meat and eggs	45.6	2.8	128	3.0
Fish	127.6	7	893	20.8
Coffee and tea	7.3	27	197	4.6
Drinking water	548	0.5	274	6.4
Total			4291	

The mean annual intake of calcium is estimated to be 560 g (approx. 200 - 250 g creta praeparata). Hence the Sr-90/g Ca ratio in Greenland total diet in 1971 was 7.7 pCi Sr-90/g Ca and the daily intake 11.8 pCi Sr-90

Table 3.2

Estimate of the mean content of Cs-137 in the human diet in Greenland in 1971

Type of food	Annual quantity in kg	pCi Cs-137 per kg	Total pCi Cs-137	Percentage of total Cs-137 in food
Milk and cream	78	14	1092	5.8
Cheese	2.5	10	25	0.1
Grain products	95.6	52	4971	26.5
Potatoes	32.8	10.8	354	1.9
Vegetables	5.5	1.6	9	0
Fruit	13.5	5.9	80	0.4
Meat and eggs	45.6	193	8801	46.9
Fish	127.6	17	2169	11.6
Coffee and tea	7.3	168	1226	6.5
Drinking water	548	0.1	55	0.3
Total			18782	

The mean annual intake of potassium is estimated to be approx. 1200 g. Hence the Cs-137/g K ratio becomes 16 pCi Cs-137/g K. The daily intake in 1971 from food was 51 pCi Cs-137.

3.9. Discussion

As previously, the most important Sr-90 source in the diet in Greenland was grain products, which contributed 40.1% of the total Sr-90 content of the diet. Fish and milk came next in importance, contributing 20.8 and 15.6% respectively. Approx. 70% of the Sr-90 in the food consumed in Greenland in 1971 came from imported Danish food; this is a little lower than earlier years' observations.

Meat was as previously the most important Cs-137 source in the Greenland diet in 1970, contributing 46.9% of the total content. Approx. 60% of the Cs-137 in the Greenland diet in 1971 came from local products, this is less than observed earlier.

As compared with the 1970 figures, the Sr-90 content in the total diet in 1971 was 20% higher than the 1970 level but the Cs-137 level was lower by a factor of 2.7. The Cs-137 levels in the Greenland diet have been very dependent on the levels in reindeer samples; in 1968 e.g. the reindeer meat (2 samples) contained 46.6 nCi Cs-137/kg, in 1969 the level was only 1.7 nCi/kg (4 samples), and in 1970 the mean level was 6 nCi (3 samples) and in 1971 we found 1.8 nCi/kg (3 samples).

To estimate the maximum per capita intakes of Sr-90 and Cs-137 in Greenland in 1971 we will suppose, as in the previous years[1], that the only grain product consumed by a person was dark rye bread, that all his meat came from reindeer, and that his drinking water was rain water with a specific mean activity of 1.7 pCi Sr-90/l and 2.7 pCi Cs-137/l (cf. table 2.2.2). His daily intake of Sr-90 would thus be 19 pCi (12 S.U.) and his Cs-137 intake 270 pCi/day (if we use the quantities in tables 3.1 and 3.2). At the lower limit we can imagine someone who ate white bread and seal or whale meat and drank water with hardly any activity (e.g. water formed by the melting of old ice). In this case the daily intakes would be 7.5 pCi Sr-90 (4.9 S.U.) and 25 pCi Cs-137. Hence the ratios between the levels in the maximum and the minimum diets become 2.5 for Sr-90 and 11 for Cs-137.

The Sr-90 content of the Greenland diet was equal to the estimated Danish mean content[2], and half the Faroese level[3]. The Cs-137 level in the total diet in Greenland was nearly 2 times as high as that of the Danish diet and four times lower than the Faroese diet level.

4. CONCLUSION

4.1.

The Sr-90 fall-out rates in 1971 were the following: Godhavn: approx. 0.7 mCi Sr-90/km^2; Godthåb: 0.9 mCi Sr-90/km^2; Prins Christians Sund: approx. 3.3 mCi Sr-90/km^2; Upernavik: 0.2 mCi Sr-90/km^2. The accumulated fall-out levels by the end of 1971 were estimated at approx. 29 mCi Sr-90/km^2 at Godhavn, 41 mCi Sr-90/km^2 at Godthåb, 147 mCi Sr-90/km^2 at Prins Christians Sund, and 17 mCi Sr-90/km^2 at Upernavik.

The mean content of Sr-90 in surface sea water collected along the coasts of Greenland in 1971 was 0.2 pCi Sr-90/l.

4.2.

The food consumed in Greenland in 1971 contained on the average 7.7 pCi Sr-90/g Ca, and the daily mean intake of Cs-137 was estimated at 51 pCi. The most important Sr-90 contributors in the diet were grain products, fish and milk products, together accounting for approx. 80% of the total Sr-90 content of the diet. Cs-137 came mainly from meat (reindeer and lamb), grain products, and fish, contributing 85% of the total Cs-137 content of the diet.

4.3.

Neither Sr-90 analyses on human bone samples nor Cs-137 determinations by whole-body counting have until now been carried out on the population of Greenland. Considering the estimated Sr-90 levels in the diet, it seems probable[4], however, that the 1971 Sr-90 levels for humans in Greenland were on the average rather similar to those found in Denmark, i.e. the mean levels in human bone in Greenland were approx. 1.1 S.U. in newborn children, 2.7 S.U. in infants, 2.2 S.U. in children and teen-agers, and 1.7 S.U. in adults (vertebrae).

REFERENCES

1) Environmental Radioactivity in Greenland in 1962-70. Risø Reports Nos. 65, 87, 109, 132, 155, 182, 203, 222, and 247 (1963-71).

2) A. Aarkrog and J. Lippert, Environmental Radioactivity in Denmark in 1971. Risø Report No. 265 (1972).

3) A. Aarkrog and J. Lippert, Environmental Radioactivity in the Faroes in 1971. Risø Report No. 266 (1972).

4) A. Aarkrog, Strontium-90 in Shed Deciduous Teeth Collected in Denmark, the Faroes and Greenland from Children Born in 1950-1958. Health Physics 18, 105-114 (1968).